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East Europe Report

SCIENTIFIC AFFAIRS

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RECENT SCIENTIFIC DEVELOPMENTS DESCRIBED

Ocean Resources Engineering Specialization

Warsaw TRYBUNA LUDU in Polish 27 Jan 84 p 6

[Article by Zbigniew Wrobel: "New Specialties: Ocean Resources Engineering on Slipways"]

[Text] (from our own correspondent) Almost all seafaring nations in recent years have become interested in the wealth of natural resources under the sea floor. Countries whose geographical position so allows have expanded their economic development zone through the 200 mile belt along their shoreline.

Other nations which have relatively limited access to the sea, such as the Baltic states including Poland, have divided among themselves the access to shelves on each sea area. Nations which have sufficient capital have been investing large sums into exploitation of mineral deposits under the sea floor, such as crude oil and gas deposits, as well as into further geological research.

This common interest in the oceans' mineral riches opens the chance for a breaking point in the current recession of world shipbuilding. The construction of ocean engineering facilities such as open sea platforms, drilling rigs, structures for submarine mining, research and auxiliary vessels, and everything that helps man extract wealth from the treasure troves of the sea have become a new fashionable and profitable occupation.

Not all shipyards in the world are in a position to manufacture these products--they require extremely high technological and quality level of shipbuilding, the highest professional class of designers and workers.

Producers specializing in this area of shipbuilding, so-called offshore shipbuilding, are limited to a small number of shipyards, mainly in the United States, Japan, France, the FRG, Britain, Holland and the Soviet Union. Three years ago, Polish shipbuilding enterprises joined this league.

This became possible mainly through contracts with the Soviet Union, which committed to our shipbuilders an assignment to build over 300 special facilities for its Shelf Program. Polish shipbuilders have acquired an excellent reputation among construction industries in the Soviet Union after building several types of technical vessels, including 11 oceanographic research vessels, a large family of smaller hydrographic boats of series 9, weather observation boats and the Vityaz, the flagship of Soviet oceanographic fleet at A. Warski shipyards in Szczecin.

This shipyard has also built two tugboats of Granit type, which, for several years, have been operating as auxiliaries to exploration drilling rigs of Petrobaltic International Enterprises.

Experiences in this field of shipbuilding have also been acquired by the Commune of Paris shipyard, which has built a bathyscaph designed by Antoni Debski for research and submarine drilling of the Geonur II project and Nauta Ship Repair Enterprises at Gdynia, which has rebuilt the Barakuda trawler into a facility for horizontal submarine drilling. Under contract to the Soviet Union as part of its oceanic engineering program, Shelf, the Warski Shipyard in Szczecin and the Lenin Shipyard in Gdansk are currently building 33 tugboats for servicing the sea drilling rigs.

At the Westerplatte Heroes Northern Shipyards, a series of firefighting boats are being constructed. Current units in the Offshore Series will soon hit the slipways. These will include, among other things, the motorboats, ships for geophysical research, which explore the sea floor structure by seismic methods, special floats, ships for drilling at different depths. The assignments are so numerous that for fulfilling the contracts with the Soviet Union all sea shipbuilding enterprises have been involved, as well as several hundred enterprises working together with the shipbuilding industry.

Arctic Human Endurance Test

Koszalin GLOS POMORZA in Polish 5-6 Nov 83 p 3

[Interview with Soviet polar explorer Dr. Vladimir Rybin by Nadezhda Majdanska: "An Unusual Experiment in the Arctic: Where Is the Limit of Human Endurance?"; date and place not specified]

[Text] These six men had been many times in conditions which before had spelled death to many in the north. An enormous stretch--10,000 km--has been conquered under conditions where the mercury stood below 50°C and the wind speeds during storms attained 30 m per second. Outside, unending Arctic nights continued for months. On Nov 6, 1982, six young scientists of the Urals Research Center of the Academy of Sciences of the USSR set out from the easternmost settlement of the Soviet Union-- Uelen (separated from Alaska only by the Bering Strait) and went on dog sleds along the entire Arctic shore of the Soviet Union. They reached their goal on July 6, 1983, in Murmansk, near the northwestern border of the USSR.

Just covering this "road" is heroism, but participants in the Polar marathon were conducting scientific experiments throughout their journey. For instance, the leader of the expedition, Sergei Solovyev, collected ample statistical material on production problems and social infrastructure of the North. Geophysicist Pavel Smolin, using a magnetometer, constructed at the Institute of Geophysics of the Ural Research Center, collected valuable data on the geologic structures along the path of the expedition. The data on individual mineral deposits are yet to be processed, but the fact that the instrument operated without failure under most difficult conditions is in itself a positive result. The radio transmitter, an Angara-1, has also passed its test. The expedition's radio operator, Vladimir Karpov, tested the frequency on which communications were possible during the aurora borealis storms and magnetic storms. The physician, Vladimir Rybin, completed a program of medical and biologic research focused on the adaptation and endurance of humans under extreme conditions.

[Question] For 243 days you were face to face with the harshest elements of nature. What for? So that those who will come to the Arctic after you could profit from their experiences; so that the secrets of extreme human endurance could be known. Where is its limits?

[Answer] In the history of the conquest of the North, there were frequent cases where people died not of cold or starvation but because of fear. A frost of 50° and no shelter over their heads. Two weeks from the nearest settlement. In the meantime, the food supply had run out. Then, psychologically, one gives up. A person dies, although the internal energy reserves were still far from exhaustion.

We agreed to this experiment. We did not use tents, warm sleeping bags. We slept on the sleds under the open skies or right on the snow.

[Question] During the polar night in the Chukot Peninsula? Even at the upper reaches of the Indigirka, where meteorologists have recorded the lowest temperatures in the Northern Hemisphere? Can the human organism endure that?

[Answer] We used the traditional Nenets clothes made of reindeer skin--malitsa. It is worn directly on the bare body with the fur inside. This fur has special kinds of hair which have the form of small tubes. After physical exertion, causing intensive perspiration, the moisture is brought through these tiny tubes to the outside. In this manner, the malitsa keeps the warmth in.

During very severe frosts, we put over the malitsa another Nenets layer of clothing, also made of reindeer fur--the gus. Over it one puts sovik--a hooded woolen parka. But even in full "armor" we sometimes were at the limit of endurance. You are holding a cup in your hand and don't feel it at all, just see with your eyes that you are holding it.

[Question] Why was this experiment necessary? Was the risk that you took worthwhile? After all, the Arctic doesn't like to be "slighted."

[Answer] We wanted to prove, and we have proven, that human life in the Arctic is not contingent on whether or not you have a roof over your head. For surviving under extreme conditions more important is the psychological factor. Just imagine two people losing one another in the tundra. One has the food supply and spirit stove, while the other has nothing. The other will die soon, but not of starvation; rather, he will die of the knowledge that spirit stove has remained with the other guy. For this reason, we expanded our experiment: we never prepared any hot food but tried to eat frozen meat, fish and all other things that one can find on the way. Many expeditions have perished because they ran out of sugar, salted meat--the conventional foods. They never thought of eating morse meat or seal meat, which was right nearby.

[Question] What if you cannot use weapons and if you cannot hunt?

[Answer] To answer precisely this question, I staged at the last segment of the expedition another experiment. I fasted for two weeks (Sergei Solovyev also fasted for eight days). What happened? I stopped to feel hungry on the third day and stopped to feel weak on the fifth. On the sixth-seventh days, there was a new surge of energy. My skin was warm, dry, with scratches and cuts healing on it quickly, muscles taut. I had the sensation of lightness and harmony in all my body. It is true that towards the end of this stint, again, I felt a weakening and had fits of dizziness. General physical exhaustion was making itself felt. After all, we had been walking for seven and a half months carrying maximum loads.

[Question] What is easier to endure, hunger or malnourishment?

[Answer] If you have food supplies for three days and have to walk two weeks, it is better to eat everything at once. Only total fasting stops the internal secretion in the stomach and bowels and switches the body to the use of internal energy reserves.

[Question] Suppose it is possible to survive without shelter and food. Can one survive without water?

[Answer] Thirst is terrible everywhere and always. The Arctic is no exception. Despite being surrounded by tons and tons of ice and huge snow mountains, if at a temperature of 40°C one puts a piece of ice in the mouth, a bit of one's tongue will be left on that piece of ice. Dry snow will not quench thirst either. It will only give you a severe chill. Generally, my advice to all those going to the North is to grow a moustache. The frost that concentrates on it gives about half a liter of fresh water a day.

[Question] Now your experiment is finished. What comes next?

[Answer] Basically, the expedition is still going on. We will again go all over those innumerable miles in our minds, analyzing our mistakes and developing recommendations. Then we will not sit too long in the laboratory. New tracks are waiting for us. We have decided to go along the entire Far East, from the same Uelen to the southernmost point of the Soviet Far East to the port of Nakhodka.

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BRIEFS

GDR-USSR COMPUTER TECHNOLOGY COOPERATION--Contracts on mutual delivery of electronic data processing equipment totaling 268 million rubles were signed in Moscow on 8 February between Robotron Export-Import and Elektronorgtechnika. The agreement provides for the delivery of 76 EC 1055-m computers to the USSR and 12 EC 1035 computers to the GDR before the end of this year. At the same time, a long-term contract was concluded, according to which a computer-controlled system produced by the Robotron combine will be put into use in the credit and finance area of the USSR for the first time. Juri Kislenko, general director of Elektronorgtechnika, emphasized that the agreements will contribute to a significant increase in productivity in the national economies of both countries. He stressed that cooperation is developing successfully in this area as well so that the attempts by the U.S. administration to hinder the use of electronic computer technology in socialist countries are doomed to failure. [Text] [East Berlin NEUES DEUTSCHLAND in German 9 Feb 84 p 2]

CSO: 2300/293a

PERSPECTIVES OF BIOTECHNOLOGY

Budapest MAGYAR TUDOMANY in Hungarian Dec 83 pp 802-806

[Article by Lajos Alfoldi, corresponding member of the Hungarian Academy of Sciences and director-in-chief of the Szeged Biological Center of the Academy: "The Perspectives of Biotechnology"]

[Excerpts] Is it worth it for us to participate in this competition? Can we even avoid participating in the competition? Do we have any chance of success?

It is easy to answer the first question; many studies of this have been prepared in the country already and it was the conclusion of each of them that we can use the new achievements of biology advantageously in our economic life. It is difficult to imagine an affirmative answer to the second question in a country which has a developed agriculture and pharmaceutical industry. The answer to be given to the third question is more difficult because it also depends on what we regard as a success.

If, let us say, we are modest and calculate that we can improve the cost-effectiveness of this or that factory or farm by introducing some concrete biotechnological procedure then we are on the soil of reality, and can count on success. But we must see clearly that this does not mean that we are participating in any sort of competition; at most we are overcoming our backwardness a bit. I consider it necessary to emphasize this fact because I have found that many in our homeland do not understand that the fundamental condition for the practical success to be derived from new discoveries is participation in the long term competition, not the short one, a systematic race which has its own conditions, laws and rules. And this competition takes place in the international arena, where the preparedness and competition style of the participants are quite different. (E. Chain writes somewhere that the cefalospirin became good business because his lawyers were good! --Editor)

We can play a successful role in the competition only if we can field a team. And we must be able to equip them. It does no harm if the members of the team want to pass on or receive the staff one to another. The stages of the relay should continue to be fitted to the competence of the individual

runners. (Amidst the economic difficulties of recent years our researchers are often surprised to find that if they have once started we expect them to run the Marathon distance alone. And sometimes the encouragement they receive is that when success is certain the last distance before the goal, the payoff, will be run for them by another.)

The question of putting the new biological information into practice is, in my opinion, primarily a question of experts. But it is well known that by the time someone wants to use in practice what he has learned in school is already obsolete. In these days biology is producing this phenomenon to a much greater degree than the average. Furthermore, the teaching of biology, from general school to university inclusively, does not always offer what we might expect of it.

So we must recognize that if we want to be competitive in the biological industries then we must pay closer attention than before to the teaching of biology. If, however, we wait until the result of this appears in our public education we will get into a losing situation a priori, because even if we were to introduce the necessary changes in the study material everywhere tomorrow by the time the students of today graduate their knowledge would be obsolete again.

So we have only one rational possibility if we want to achieve results quickly: further training after the university. If we handle this method flexibly and do not bureaucratize it, it could be extraordinarily effective. For this reason the preliminary Biotechnological OKKFT [National Medium-Range Research and Development Plan] now being developed appears very fortunate, because post-graduate training will form an organic part of it.

But when organizing further training programs we must be clear about the fact that the expert needs for any biotechnological program are most complex. The program will need basic research corresponding to the best international standards, and this requires people with a theoretical orientation. There will also be a need for applied and developmental research broader than at present, and this will require researchers and research sites specializing appropriately in technological research. Finally, even the factory engineer, chemist and economic leader must have modern biological foundations if they are to work in this area.

So the further training programs must be extraordinarily varied. Only with the aid of suitably informed experts, experienced in molecular biology and the new technology, will we be able to select from among the possibilities offered by the new information what it would be worthwhile to use in the interest of realizing our economic tasks.

It follows, however, from what has been said that if the biotechnological trend produces only possibilities so far, by and large, much money and work must be invested before the use of them will become a significant factor of our economy. And it is well known that at present the country has very

little money to invest, and it is trying to make this pay off in the short term. So the future of domestic biotechnology is a question of rank ordering, of preference. And the rank ordering depends on what alternatives we can pose. For my part, I feel that exploiting the new possibilities given by living systems can be one of the most promising branches for the long-range economic policy of a country poor in energy and raw materials.

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GENETIC ENGINEERING VIEWED

Budapest MAGYAR TUDOMANY in Hungarian Dec 83 pp 807-812

[Article by Pal Venetianer, doctor of biological sciences, deputy director of the Szeged Biological Center of the Hungarian Academy of Sciences: "Gene Surgery, or Genetic Engineering"]

[Excerpts] What is the status of Hungarian genetic engineering as compared to the much mentioned world level? Naturally I cannot regard it as my task to give a detailed evaluation; I would like to stress only one aspect. It is already a commonplace to say that the speed with which a methodological discovery born in basic research--genetic engineering--has become a direct productive force is unexampled in the history of the biological sciences. Also unexampled is the gigantic reordering which has taken place in science policy, financing, the relationship between industry and basic research, the income and livelihood of researchers, etc. which has accompanied this swift development, primarily in the developed capitalist countries. Some aspects of the changes do not necessarily please everyone (including us), but independent of value judgments they are undeniable facts. One factor explaining the gigantic development is the extraordinary size of the potential practical profit. Another--and perhaps this is a surprising statement--is that genetic engineering research is extraordinarily cheap, it requires no special large instruments and can be done in any molecular biology research site with routine equipment. The bottleneck determining the speed of this research everywhere in the world is the insufficient number of talented researchers with suitable training and not the money needed for the research. Everywhere in the world--with the exception of the smaller socialist countries, including our homeland. This work is cheap, but it does require the constant use of good quality special chemicals and research tools of smaller value, which we can acquire only from capitalist import (and even from there slowly, clumsily and irregularly). This is the bottleneck for us. And so we are leaving unexploited the most valuable--intellectual--capital, or are using it with low efficiency, although ridiculously small sums would be required to ensure the appropriate conditions. If this situation does not change the wasting of this intellectual capital will be unavoidable. Despite the unemployment vexing other special intellectual areas a well trained researcher experienced in genetic engineering can choose among dozens of offered positions in any developed capitalist country.

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BIOTECHNOLOGICAL PROCEDURES AND FACTORY SCALE OPERATIONS

Budapest MAGYAR TUDOMANY in Hungarian Dec 83 pp 813-822

[Article by Janos Hollo, Laszlo Nyeste and Bela Sevella, of the Budapest Technical University: "Biotechnological Procedures and Factory Scale Operations"]

[Excerpts] Problem of Raw Material (Substratum), Bioreactor

In the opinion of many we are just now entering the age of so-called "large-scale biotechnology," which is indicated by the swift increase in the size of fermenters used. In our country today a fermenter capacity of about 1,700 cubic meters makes it possible to carry out sterile aerobic fermentations, which means for the most part fermenters of 20-50 cubic meters; there are only a few fermenters in the 100-115 cubic meter range. The largest fermenters in the world's pharmaceutical fermentation industry have a volume of about 300-450 cubic meters; a 3,000 cubic meter fermenter is operating in the SCP [Subcellular Preparations] plant of the ICI [Imperial Chemical Industries], but according to our information they have already designed a 5,700 cubic meter fermenter for this purpose.

A Few Technical Problems of the Bioreactor

It is gratifying that all our fermentation plants are attempting to use not only laboratory (flask) scale for the development of their products but also large laboratory scale and semi-factory scale. Very modern, well instrumented "pilot plants," even plants connected to a computer, have been developed in these factories. In view of the fact that fermentation technology instruction is offered in our country only at the Agricultural Chemical Technology Faculty of the Budapest Technical University, at the graduate and post-graduate level, this faculty also has proposed to set up a modern fermentation "pilot-plant" on the large laboratory scale.

Going beyond the traditional fermentation instrumentation (measuring temperature, pH, dissolved oxygen level, etc.) they are already using such modern analytic procedures as the mass spectrometer, which makes possible precise measurement of gas metabolism and direct measurement of certain products. The introduction of the mass spectrometer is a qualitative change, because

compared to the single fermenter-instrument links used thus far it provides information simultaneously about several bioreactors (perhaps about the entire fermenter park of a factory).

The cytofluorograph (laser technology), microcalorimeter and enzyme and microbe electrodes are newer analytical tools which help us to form a more complete picture about biological processes. These are supplemented by linking high pressure liquid chromatography (HPLC) and automatic analysis methods (e.g., CONTIFLO) with fermentation.

Every pharmaceutical factory in our country has taken the beginning steps in this area; indeed, the introduction of the mass spectrometer is on the agenda also (BME-ATOMKI-BIOGAL [Budapest Technical University-Nuclear Reserch Institute-BIOGAL]). A fermenter-instrument system-computer (microcomputer) link has been realized also, or is under way in a number of our plants and research sites (BME, BIOGAL, the Kobanya Pharmaceutical Factory), and in accordance with this they are slowly forming in these places teams of microbiologists, chemical engineers, electrical engineers and mathematicians which can try to find a successful solution to a complex sphere of problems. So there are initial attempts, but it appears that a very long and tiring road still leads to the domestic realization of the first truly on-line process control or computerized control of an entire fermentation plant.

A special and very difficult problem of biotechnology is extracting the effective material from the ferment liquid. This must be done product by product--with the equipment used in the chemical industry--on the basis of very long preliminary tests, and the optimal manufacturing procedure must be developed on the basis of this. This step figures as very significant among the production costs of the product--frequently causing very large material losses also. For this reason we must note with pleasure that setting up an experimental plant for this purpose figures in the long-range plans of both the pharmaceutical factories and the BME.

Enzyme Engineering

We must note that pioneering work has been done and is being done in this area in our country; we are thinking of the enzyme beer manufacture realized here for the first time in the world and of the initiative undertaken in the use of immobilized glucose-isomerase (BME and the Szabadegyhaz Distillery).

A certain transition between enzyme engineering and fermentation technologies is represented by those procedures in which they use so-called fixed cells or cell organelles. The goal here, the scientific-technical task to be solved, is to produce stable fixed cell preparations which do not grow old and do not multiply, or do so to only a very small degree, which can be used for a long time, with the aid of which valuable products can be produced.

It must be emphasized that the possibilities for industrial exploitation of enzyme engineering are limited by the same scale increase and process control problems that limit the fermentation industries. Microprocessor control of fixed enzymes or cell bioreactors, optimization of the given processes and recognition and control of mass transfer processes can be called the most important tasks. The development of bioreactors suitable for industrial scale, by solving the scale increase, is also an indispensable task.

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PRODUCTION AND USE OF MONOCLONAL ANTIBODIES

Budapest MAGYAR TUDOMANY in Hungarian Dec 83 pp 823-831

[Article by Istvan Ando, candidate in biological sciences, a scientist at the Szeged Biological Center of the Hungarian Academy of Sciences: "Production and Use of Monoclonal Antibodies"]

[Excerpts] Use of Hybridomes and Monoclonal Antibodies in Hungary

The first hybridome was described in 1975 and as a result of research in the subsequent 5 years the method became a technology which could be widely used. It is thanks to this that the industrial production of monoclonal antibodies also began soon thereafter. At present more than 50 firms throughout the world are dealing with the production of hybridomes or with the production and sale of monoclonal antibodies.

The first hybridomes were produced in Hungary in 1977, but the method and use of the antibodies on a wider scale is just beginning to spread now. The method has been adopted successfully only in institutions where they have succeeded in combining flexibly in the laboratories both tissue culture and immunological methods. Tissue culture work is not among the cheap methods, so as a first step for the production of hybridomes they had to ensure the material conditions which were necessary for acquiring the new equipment connected with the profile modification. Most successful are those research sites where there were experts experienced both in tissue culture and in use of immunological methods and where work could begin with minimal material expenditures. A good framework for this was provided by the MTA-KKP/2 [Hungarian Academy of Sciences Medium-Range Research and Development] program titled "Biotechnological Research, With Special Attention to Gene Technology" supported by the MTA, thanks to which not only could research already in progress continue but new possibilities opened up for the production of monoclonal antibodies. At present the production of monoclonal antibodies or introduction of the method is taking place in more than five institutions. In addition they are beginning to use monoclonal antibodies routinely in even more institutions, to study cell surface antigens.

Several reagents accessible to everyone are coming into the country with the mediation of Western trading firms. This does not mean that the monoclonal

antibodies are among the diagnostics or reagents generally used in our homeland. Our institutions manufacturing and trading in serological preparations are not sufficiently flexible from the viewpoint of trading in antibodies. More than 30 antibodies which could be used in diagnostics and research have been produced in our homeland thus far, but they have not yet found a manufacturer or trading firm, although there is a demand for good quality reagents in very many research and clinical laboratories. Despite the inflexibility of the manufacturing and trading firms it has been possible to satisfy the demand for all domestically produced monoclonal antibodies so far because the institutes producing the hybridomes have undertaken industrial production of, and later trading in, the antibodies.

Reviewing the situation of domestic research connected with hybridomes we can say that the method of producing monoclonal antibodies has been adopted with the support of the MTA and we have succeeded in producing antibodies which can be used in practice and which have aroused broad interest; but the question, "How to proceed toward practical utilization?" still awaits an answer.

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APPLICATION POSSIBILITIES OF BIOTECHNOLOGY IN PLANT CULTIVATION

Budapest MAGYAR TUDOMANY in Hungarian Dec 83 pp 844-849

[Article by Adam Kondorosi, candidate in biological sciences and scientist at the Szeged Biological Center of the Hungarian Academy of Sciences: "The Application Possibilities of Biotechnology in Plant Cultivation"]

[Excerpts] It is very difficult in agriculture to protect plants against the viruses which attack them. Thus it is very important that we use as starting material propagation material which is guaranteed to be virus-free. Virus-free tissue cultures are outstandingly suitable for this. The production of virus-free plants on an industrial scale can be realized today. This technique is used in Hungary at a number of research institutes and producer cooperatives. It was for this purpose that they established, for example, the MERIKLON Research, Development, Production and Economic Association, where the method is used successfully to produce virus-free fruit-tree stock, grapes and decorative plants. They have also made preparations to produce propagation material for potatoes in this way.

Increasing Biological Nitrogen Fixing

We already know that the genes coding nitrogen fixation are in the bacterium, but the creation of the symbiosis is controlled partly by the genes of the bacterium and partly by the genes of the plant. Enough information about the Rhizobium bacteria has been collected to make enrichment of them a realistic task. At the Szeged Biological Center, for example, in the course of a study of alfalfa and the nitrogen fixing Rhizobium strain in symbiosis with it, we determined and isolated some of the symbiotic nitrogen fixing genes of the Rhizobium. We have the techniques with the aid of which the Rhizobium genes can be transferred into other bacteria.

With the use of these techniques the properties useful from the viewpoint of nitrogen fixation can be united in a hybrid strain (for example, more efficient nitrogen fixation, resistance, competitiveness against other Rhizobiums, toleration of extreme soil conditions, etc.). Naturally the "super" Rhizobium strains can bring economic profit only if production of the inoculation material and the associated agrotechnology are optimal. Thus the development and use of these biotechnological procedures is a very important task. In Hungary the Protein Program Office of the OMFB [National Technical Development Committee] coordinates such research and development activity in the country.

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NEW DEVELOPMENTS IN SCIENCE, TECHNOLOGY DESCRIBED

Specialized GEO-20 Minicomputer System

Warsaw POLISH ENGINEERING in English No 3, Mar 84 p 4

[Text] The Institute of Information Science of the Technical University of Warsaw has developed, in cooperation with the Computer Centre for Geodesy and Cartography, the GEO-20 specialized minicomputer system designed for performing geodetic calculations and managing the operation of surveying enterprises. The coupling of the specialized geodetic software with a data logger and data processing systems has provided a comprehensive solution to most computational problems met with in surveying enterprises. The dedicated equipment and specialized geodetic software allow the application of the GEO-20 minicomputer system in a way giving an entirely new quality to the work being done by surveying enterprises. All assignments are done faster and cheaper, while a much higher quality standard of the work is achieved at a considerable alleviation of the work and at its much higher efficiency. The specialized geodetic minicomputer system GEO-20 comprises the following hardware:

— the UMC-20 central processing unit,
— the MERA 94-25 disc memory unit,
— 2 — 4 belt memory units PT 105-1,
— the DZM 180 K system monitor,
— the DZM 180 dot-matrix printer,
— the DT-105 punch,
— the CT 2200 reader,
— 4 — 16 terminal units EMA-480,

and a basic software system, comprising:

— the MISS 75 operating system,
— the SFINX data logger,
— the FORTRAN IV programming language,
— a set of testing routines.

The CPU comprises a processor with an extensive list of instructions, a co-ordinator, a 32 K operating store (16 bit words), fast data transfer channels: selector channel (600,000 bytes/s), and a multiplexer channel (300,000 bytes/s), disc and belt memory control units, input terminals, integrated monitor control units, a punch and a reader, printer control units, and a time clock. The whole system is built from components and equipment made in Poland. The GEO-20 system may be interfaced with other computers, e.g. the ODRA 1304, and the RIAD series computers, and with the DIGIGRAF series automatic drawing devices.

New Integrated Circuit Technology

Warsaw POLISH ENGINEERING in English No 3, Mar 83 p 7

[Text] The manufacture of bipolar or MOS integrated circuits requires the connection of the structure contact fields (10 — 64 contacts) with the corresponding contacts of the pack. These connections are made using sections of gold wire with a diameter of 25 or 38 μm whose ends are generally welded together by the thermo-compensation technique. This connecting operation is very labour-consuming. In order to optimize that operation and to develop a technology speeding it up, a special research project was launched at the Industrial Institute of Electronics.

As a result of that project, a new technology of making those connections by a combined mash seam and percussion welding technique was developed. This new technology allows the completion of the above operation in a period some 5 — 10 times shorter than that necessitated by the previous techniques. At the same time, the design of the C14 mash seam and percusssion welder for making connections in integrated circuits was developed.

The new technology involves the connection of integrated circuit components by percussion with a suitable energy, using a light-weight tool followed by a short-lasting static pressure. The percussion leads to a preliminary deformation of the weld material. The actual connection process occurs in the very first milliseconds over a large contact area. Good connections are thus obtained within about 10 ms (in static methods — 50 — 100 ms).

The C14 mash seam and percussion welding machine is a complex piece of machinery which performs automatically over ten different functions necessary for making contacts between the integrated circuit components and its pack. These functions cover the following operations: selection of semi-products, their precision positioning in the operating position, their warming up to a given temperature, the making of a dozen or so successive contact connections followed by their checking up. All these operations take place fully automatically, the task of the operator being limited to adjusting the sight onto a given point of the sized structure. The extremely rapid working cycle of the C14 welder (1.4 — 1.8 s), making possible the assembly of integrated circuits with an output of from 2000 pcs/h to 2400 pcs/h, constitutes its chief advantage. Most of the working cycle is taken up by the making of the connections (1.2. — 1.5 s), a single connection (loop) being made within some 85 — 100 ms. That latter operation involves the making of a bead at the gold wire end, the connection of the bead with the integrated circuit structure, the making of a loop between the circuit structure and the pack, the connection of the wire to the pack, and the breaking of the wire. The attainment of such a short connection time has been made possible by the application of the original mash seam and percussion welding technique developed at the Institute along with a number of up-to-date technological solutions cutting down to a minimum the duration of other operations.

Besides its very high output, the C14 welding machine features the high accuracy indispensable for performing all technological

operations. The accuracy of welds positioning is as high as +15 μm. The C14 welder moreover features a high versatility, close to that typical of electronic-controlled devices.

The infinitely variable control of the cams, and the electronically programmable capillary lifting system ensure the assembly of integrated circuits with various structural dimensions and different numbers of contacts. The C14 welder design is specially adapted to manufacture a very large number of the DIP 14 circuits (with 14 leads). After cam replacement, the C14 can also manufacture the DIP 16 circuits (with 16 leads).

The combined mash seam and percussion welding technique and the C14 welder may be used for the manufacture of semiconductor and optoelectronic components in which the connections are made by the thermo-compensation method. The C14 welders have been applied at the semiconductor Factory TEWA with success, and five C14 welders have replaced there 15 type ADB machines made by the firm of ELEKTROMAT. Application of the C14 welders gives labour savings of the order of 40,000 man-hours/ /year during two-shift plant operation.

The new technology herein presented and the C14 welder have been awarded one of the Team Prizes of the Chief Technical Organization NOT during this year's Master of Technology Competition — Warszawa 1981.

First Infrared Radiation Detector

Warsaw POLISH ENGINEERING in English No 3, Mar 83 p 17

[Text] The first in the world non-cooled photon detector designed for the detection of infrared radiation of wave length 8-12 μm (optimized wave length 10.6 μm) has been manufactured in the Plasma Physics and Laser Microsynthesis Institute, in close cooperation with the Technical Military Academy. The "father" of the technology is Professor Piotrowski from the Technical Military Academy while the construction and idea of utilization of the new instrument stem from the Plasma Physics and Laser Microsynthesis Institute in Warsaw.

The elaboration of a new and really sensational technology was the logical outcome of research work carried out in Poland on cadmium-mercury telluride. The first elaborations concerning the above semiconductor have been published in the years 1963-64 by such Polish scientists like Giriat, Gałązka and Dziuba. And it was just on the basis of that new semiconductor that the non-cooled infrared radiation detector has been constructed.

The basic advantage of the Polish detector is that it does not require cooling. It can, therefore, be placed in vacuum and can easily be protected against electromagnetic interferences. The so far made detectors must be cooled by means of liquid nitrogen to a temperature of approx. -200 °C. they are, therefore, larger and less convenient to handle in experimental use.

It is true, that in the world pyroelectric detectors are made also not requiring cooling yet the Polish detector is thousand times more sensitive at a comparable reaction speed.

The Polish infrared detectors are — in comparison with certain versions of detectors cooled by means of liquid nitrogen, so called

photodiodes — less sensitive at the same reaction speed. They are, at the same time, much more convenient to use, do not require the application of a wideband amplifier and make possible direct recording on an oscilloscope as they allow to attain, at certain methods of exploitation, large voltage signals of the range of several dozen or even a hundred volts. They can, therefore, be used wherever such a great sensitivity, like in the case of photodiodes, is not required.

On the other hand, its advantageous features are:

— ultrashort reaction time — 1 ns
— comparatively high sensitivity — above 10 mV/W
— large signal — above 1 V
— wide dynamic range
— small overall dimensions
— competitive price.

The new Polish development found great recognition in the world. Photon detectors are already used, for instance, in laser technology centres Culham (Great Britain) for heterodyne detection and in Los Alamos (the USA) for monitoring laser radiation.

These detectors are designed for operation with a CO_2 laser for diagnozing laser radiation, e.g. for controlling welding, laser cutting, in microelectronics in data transmission systems etc.

Irrespective of the introduction into production of the photon non-cooled detector of 10.6 μm range the Plasma Physics and Laser Microsynthesis Institute manufactures a complete range of other traditional detectors, including also liquid nitrogen cooled detectors for infrared radiation detection of wave lengths from 3 to 15 μm. All detectors are exported with the intermediary of the Foreign Trade Enterprise LABIMEX. (A.O.M.)

New Acid-Proof Protective Coating

Warsaw POLISH ENGINEERING in English No 4, Apr 83 p 31

[Article by Waldemar Reszniak and Larisa Smirnowa: "Acidproof Protective Coatings and Method of Obtaining Them]

[Text] **The recently newly developed in Poland acidproof protective coatings are obtained from a substance made in a simple way from low grade cheep material or production wastes. This influences the manufacturing and application costs of these coatings in relation to traditional materials.**

The coat-forming substance is obtained by passing the proportioned powdered material through a stream of hot or ionized gases of 1,500—2,000 °C and coating the surface of determined materials with a jet of fused particles of large kinetic energy.

The heating-up temperatures of coated materials range during the coating process from 100 to 180°C.

This range of temperatures excludes the possibilities of the occurrence of the disadvantageous effect of materials deformations accompanying their thermal expansion. The coating obtained

has a considerable chemical resistance to the action of all ordinary and concentrated acids as well as strongly oxydizing compounds at the simultaneous temperature resistance.
The invented coats can serve for coating special purpose equipment so as to ensure protection against atmospheric, chemical, electrical, lye, water and soil corrosion. They also have dielectric properties.

The above substances can be used for coating all metals used for the construction of technical equipment, gypsum, ceramics, glass and even wood. The presented solution may become a new method of reconditioning relics of the past, monuments, objects of art, and a simple way to protect and preserve, at the ensuring of a stony facing susceptible to grinding in plastic arts (sculpturing).

The utilization of the newly developed coatings in the production of chemical apparatus makes possible the replacement of costly acid resisting steel sheets with sheets of lower steel grades which brings definite economic effects. The same refers to the costly and labour consuming rubberizing of tanks for certain chemical substances. Coating with an acidproof substance of some sugar industry equipment and communal equipment (water and sewage pipelines) operating under difficult conditions prolongs their exploitation considerably excluding many unforeseen breakdowns.

The above named applications concern equipment in which the medium itself contacts the vessel walls and which are not exposed to intensive abrasion, deformation and other mechanical factors that could damage the deposited coatings.

The price of equipment for running the process in relation to the output at industrially applied coating is very convenient and is by all means a quickly repayable investment bringing considerable profits.

The low cost of materials used and the technical qualities of coatings obtained acc. to the invention permit to attain highly economical and durable protective coatings requiring no regeneration. In the case of a licence contract for the application of the above solution the patent owner — the Voivodship Water and Sewage Enterprise in Olsztyn — ensures with the intermediary of the Foreign Trade Enterprise POLSERVICE:

- delivery of process documentation
- carrying out of tests and investigations in a definite direction upon the order of the licencee with the intermediary of a research unit.

CSO: 2020/67

DEVELOPMENT OF ENVIRONMENTAL POLLUTION, PROTECTION OUTLINED

Outlays for Environmental Protection

Warsaw KURIER POLSKI in Polish 27 Dec 83 p 1

[Article by (tan): "Eighty-Five Billion Zlotys Assigned for Environmental Protection: Money Alone Is Not Enough; 11,500 Pollution Sources, 158 Enterprises Blacklisted"]

> [Text] In 1984, 35.3 billion zlotys will be spent on environmental protection and 50 billion zlotys on water management. These seem to be huge sums, but only at first glance. In actuality, they are not exorbitant: backlogs in reclamation of damaged environments are too large.

More than 11,500 principal sources of water, soil and atmospheric pollution have been registered in the nation. Continuing violation of admissible norms of liquid and gas emissions are observed on 3 percent of Poland's territory. From year to year, more rivers become stench-filled gutters. Back in 1967, 36.6 percent of rivers belonged to purity class I, while now only 9 percent do. A major problem is industrial waste, which has been growing at a terrifying pace.

Surface waters are polluted by as many as 13,523 enterprises. Of these, only 7,425 have a regulated status in terms of water laws--that is, generally speaking, have a license for discharging a certain amount of effluents with a given admissible concentration. The rest virtually pollute water without observing any norms or having any license, in a "wild" fashion. Of the 1,063 enterprises especially hazardous for the atmosphere, only slightly over 800 have a defined admissible emission level. We believe that the new Central Office of Environmental Protection and Water Management is working efficiently to do away with these practices. The Government Environmental Protection Inspector's Office has on its blacklist 158 enterprises that are doing the greatest harm to the environment. It is important to act quickly to bring the recommendations into effect, so as to greatly reduce the damage done by factories, furnaces and mills to the environment.

Of the planned 35.3 billion zlotys in spending, 60 percent of outlays in 1984 will go into construction of sewage treatment plants, 20 percent into air protection and 20 percent into earth surface protection. In particular, the construction of 43 sewage treatment plants with a total daily capacity of 740,000 cubic meters will be completed. At many enterprises, dust traps will be installed that will capture thousands of tons of pollutants. Of the water management outlays, some 13 billion zlotys will go into centralized capital investment.

Though 30 percent more funds are allocated in 1984 than in 1983, a great number of things will still remain to be done. This stresses the importance of environmental protection methods which do not involve monetary outlays. Major reserves are available in this area. Regular surveys by inspectors indicate that in a great number of factories and plants little care is taken of environmental protection equipment; even where it has been installed, it malfunctions or is inoperative. There is also a shortage of maintenance personnel for sophisticated environmental protection technology. Smooth operation of this equipment and its total utilization, however, is the main route for saving nature from damage.

Assessment of Pollution Problems

Warsaw RZECZPOSPOLITA in Polish 15 Nov 83 p 4

[Article by (masz): "An Analysis by The Supreme Control Chamber: Environmental Protection Cannot Wait--Air and Water Pollution; Waste Dumps Grow; How the Number of Polluters Can Be Curtailed"]

[Text] Three years have passed since the introduction of the law of protection and development of the natural environment. Evaluation of the current situation in this area in the light of implementing the law has been the subject of a survey conducted upon the recommendation of the Speaker of the Sejm by the Supreme Chamber of Control [NIK].

The NIK survey has shown that it has not been possible to fully stop the degradation of the environment. Although, according to the Main Statistical Data Office, the amount of dust emitted into the atmosphere in 1982 decreased by 20 percent and that of gases by 7 percent compared to the 1980 levels, it is too early to speak of tangible improvement. Of 1,063 enterprises emitting the largest amounts of dust and gas, emission measurements are done only at 60 percent of these. The others calculated emissions approximately, in particular, using technological documentation, the amount of fuel burned or the capacity of treatment facilities. This fails to consider the use of fuels of poorer quality, technical malfunctioning of equipment and changes in the technology and nomenclature of products.

The greatest level of air pollution occurs in the following provinces: Katowice, Krakow and Legnica. High concentrations of pollutants create direct hazards to public health in many localities.

Particularly worrisome is the fact that in areas of greatest air pollution the amount of emissions has greatly increased at some enterprises. For example, the Lubin Mines in 1982 emitted 78 percent more ash and 51 percent more metal dust than in 1981. Chemitex-Cel-Wiskoza Chemical Fiber Enterprise at Jelenia Gora emitted in the first quarter of 1982 912 tons of carbon disulfide, which is 18 times the admissible amount, and 311 tons of hydrogen sulfide, which is 20 times the norm.

Of a major hazard to the surroundings of many enterprises is the absence there of protection zones. Of 1,063 enterprises at the end of 1982, just 98 had devleoped a protection zone. This situation is due, among other things, to government administration's failure to insist upon compliance in developing such zones. Enterprises remain unconcerned about this. Years of delays in this area are difficult to counteract. About 70 percent of enterprises are situated within 500 m of residential buildings. Establishing protection zones would call for resettlement of residents.

Excessive emission of dust and gas is deleterious to soil, farmlands and forests. For instance, more than 500,000 ha of forests--6 percent of wooded territory--are within the area of harmful effects of industrial enterprises. Damage to tree stands has been estimated at 1 million cubic meters of timber annually.

Another problem is the growing amount of industrial waste. At the end of 1982, dumps and landfills accounted for 1.109 million tons of various industrial wastes, 20 percent more than in 1980. These wastes occupied an area of 10,159 ha. Recently, the area of recultivated lands has increased; however, a greater area is occupied every year by wastes than what is brought back into cultivation. The amount of residential waste has also been growing, as well as the number of "wild dumps."

The condition of water in rivers and lakes, as well as the near-shore waters of the Baltic Sea, is deteriorating. This is due to the large amounts of pollutants discharged into surface water by industry. Of 3,574 enterprises discharging large quantities of effluents, 2,201 do not treat sewage. Most of the treated and untreated sewage contains higher amounts of pollutants than allowed by the standards. In particular, at the Glogow Copper Mill, overload of sewage treatment installation resulted in a copper concentration 12 times the admissible level, and 52 times higher tin concentrations in effluents. The concentration of heavy metals in effluents discharged by the Gniezno Tannery Enterprises was 167 times the admissble level. All biological life has been killed in the reservoir receiving this sewage. Two natural lakes connected with it have excessive amounts of pollution due to failures in observing the treatment technology and doing the necessary equipment conservation and repair, as well as a shortage of treatment facilities.

The number of surveys by enterprises and local administrations has increased since the passage of the law. It is not yet sufficiently effective, however.

One factor is the shortage of testing and measurement equipment and vehicles. Organization of health care services is still inadequate.

In the environment of an economic reform, enterprises are primarily responsible for environmental protection. Their contribution to financing environmental protection investments will amount to 62 percent of the total in 1983. In the following years, this share is expected to grow even further. An incentive should be provided by tax benefits. These credits, however, are insufficient, because they apply only to investment over a period of two years. Because of the major existing shortfalls, implementing these programs will be impossible without government assistance.

It is mandatory for the enterprises to become more concerned with environmental protection. Effective Jan 1, 1983, by decree of the Council of Ministers, fines paid for violation of environmental regulations will be treated as unjustified costs, raising the taxation basis, which may become an effective weapon in the fight against "poisoners."

The findings of the NIK survey are alarming. Environmental protection calls for fast and effective actions.

Extensive Water Pollution

Warsaw RZECZPOSPOLITA in Polish 26 Jan 84 p 3

[Article by Kaj.: "Pollution in Polish Rivers: Only 1 Percent in the First Purity Class; Threat to the Vistula and the Oder"]

[Text] Poland's surface waters, especially her rivers, are below the standard purity class requirements. The increasing water degradation over the last few years is alarming. If one takes into account, along with physicochemical contaminants, bacteriologic pollution, then only 1 percent of rivers will be in purity class I, 19 percent in class II and 31 percent in class III.

Almost half of Polish rivers are below mandatory requirements. Particularly heavy pollution is observed in: the Ner, Welna, Bug, Bzura and Utrata, which, throughout their entire length, are below purity class standards.

Economically, most disconcerting is the degradation of the waters of the Oder and the Vistula. In the Vistula Basin, the rivers receive over 6 million cubic meters of sewage, of which only 10 percent is properly treated. Mercury content in the Vistula near Krakow was 200 times the admissible level in 1980. In addition to mercury, excessive quantities of chromium, copper, tin, iron and manganese were registered.

The purity condition in the Oder Basin is also disconcernting. More than half of the river's length is contaminated. Only 6 percent belong to the first purity class. The Oder receives contaminated water from the following cities: Raciborz, Kedzierzyn, Zdzieszowice, Krapkowice and Opole, and

numerous industrial enterprises across the territory. Further increase of pollution discharge takes place in Lower Silesia. On the segment up to the mouth of the Kaczawa River, industrial effluents from 295 factories are discharged directly into the Oder. Only 28 percent of these undergo biological treatment, and 53 percent mechanical treatment. The remaining 19 percent flow into the Oder with the pollutants.

The quantity and quality of sewage discharged into the Oder are such that this second largest Polish river carries non-class water over 87 percent of the length of its course.

The heavy pollution level in Polish rivers results from the fact that they serve as a convenient receptable for inadequately purified industrial and city wastes. This has created a situation where more than 50 percent of flowing water used by urban water supply systems fail to meet quality standards.

Elimination of Pollution Sources

Warsaw TRYBUNA LUDU in Polish 24 Jan 84 pp 1, 2

[Communication by the Polish Press Agency [PAP]: "Problems of Environmental Protection: Elimination of Pollution Sources"]

> [Text] On January 23, 1983, a joint session of the Presidia of the Commission of Health and Environmental Protection of the Central Committee of the PZPR and the State Council on Environmental Protection, with participation of the leadership of the Office of Environmental Protection and Water Management, took place under the chairmanship of member of the Political Bureau of the Central Committee of the PZPR Zofia Grzyb.

The participants in the session heard reports concerning plans in the area of environmental protection to be implemented by the newly established government ministry in 1983.

"Neglect for environment protection observed in practically all economic spheres calls for efficient action and systematic long-term efforts," said Stefan Jarzebski, Minister and Head of the Office of Environmental Protection and Water Management. "They must be linked with capital investment, which has its limitations, as well as efficient utilization of existing capacities for limiting the damage done by enterprises to the environment. Primarily, this involves a proper operation of existing environmental facilities, constant measurements and tests, and improvements of health services. Both require administrative incentive to stimulate economic mechanisms, as well as to enforce legal regulations. Today all available facilities should be used in a businesslike fashion."

In the coming years, efforts will be exerted to complete the building of approximately 350 sewage treatment facilities. As to protection of the air, the construction should be completed of protective installations, particularly at enterprises that produce the most hazardous emissions. To this end, 16 billion zlotys will have to be allocated. Introduction of these facilities will help capture about 1 million tons of airborne dust annually. Unfortunately, no basic changes are envisaged in containing the dust contamination, especially suflur dioxide.

The central annual plan for 1983 allocates 35 billion zlotys for environmental protection. This is 30 percent higher than projected implementation of investment assignments in 1983. Most efforts be concentrated on urban-industrial centers and in areas with developed industry. Much importance is also given to efforts towards bringing the existing environmental protection facilities into better shape. This will involve strengthening the testing and measurement services, which will pay more attention, among other things, to compliance with regulations in industrial processes. The significance of economic reform for environmental protection was noted by Professor Zdzislaw Kaczmarek, Chairman of the State Council for Environmental Protection. Half of the funds allocated to this objective are held by enterprises which must be alerted to the need for environmental protection. This can be properly controlled by economic incentives. This objective will also be served by imposing a tax on the use of the environment, as well as fines--still too low--for violating environmental regulations, to be paid from profits.

The best method for curtailing the degradation of the environment, however, would be eliminating its sources. This includes low-waste or waste-free technologies, with recapture of raw materials and semifinished products contained in industrial waste--a growing practice in industrialized countries. Similar steps are envisaged in Poland by a dozen or so industrial enterprises, including B. Bierut Metal Mills, Bobrek and Katowice Enterprises and several cement plants.

Environment protection today is a political issue involving the fulfillment of public expectations.

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DEVELOPMENTS OF POLISH ACADEMY OF SCIENCE OUTLINED

Scientific Secretariat Meeting

Warsaw ZYCIE WARSZAWY in Polish 11 Jan 84 p 6

[Article by b.k.]

[Text] The first meeting for the 1984-1986 term of the newly elected Educational Secretariat administration of PAN [Polish Academy of Science] was held on the 10th of January. Priorities of assignments facing the supreme national education institution were established.

These are mainly projects relating to the fulfillment of the nation's requirements. PAN intends to center much of its attention on problems of the national economy reform, its procedures and society's conditioning, on the rational utilization of national assets at a time when we cannot afford additional expenditures, and on the prudent and economic utilization of energy and raw materials.

The economy should be able to find applications of developments in areas in which Polish science has available significant manpower potential and valuable achievements in microelectronics, biochemistry and molecular biology.

Prof Dr Roman Ney proclaimed that the overall responsibility of the academy in the coming year is the development of a new outline for the national economy. The professor said, "Up to now we have had a self-defeating economy. Even if we achieve a worldwide leading position in an industrial or mining process, the results are nullified through the inefficiencies of other divisions of the economy and consequently nothing finds its way abroad. For example, we have increased our coal production considerably, but the major part of the gain is consumed by our heavy industry in the production of machines and tools which eventually go back again into the mines.

We also show no activities in coal conversion. The GDR has raw materials which are inferior to ours, still the results attained by their chemical industry exceed ours. We must categorize the Polish specialties and promote an economic system that would put them to good use.

Prof Dr Waclaw Sawka, secretary of the PAN offices in Katowice, discussed the subject of technical research utilization within the economy. There are many good studies lying around in drawers because industry is not interested in them. In the new system for organizational fundamental and technical studies a remedy for this situation will have to be found.

Prof Dr Lech Kobylinski brought attention to the fact that currently, the potentials of technical know-how are far greater already than the existing possibilities of exploiting them. There is therefore no further necessity to expand them, but rather, the necessity to put them into use. Here however in opposition stands a long accepted system of seeking degrees and educational titles. This system shows preference for smaller projects, requiring only paper and pencil, and not for collective efforts which require arduous work in incorporating research findings into the economic structure. If a legitimate solution for this situation will not be found, then several initial years of scientific studies will have only preduced scramblings up the ladder of doctorate degrees and assistant professorships.

Prof Dr Zdzislaw Kaczmarek, educational secretary of PAN, informed the assembled members that in the near future matters concerning the organization and division of authority within the Polish educational system will be determined. It is expected that a final decision at the government level, concerning the establishment of a central body for the undertaking of educational and technical matters, will be made in February.

It is contemplated that sometime near the end of January this case will be debated at the government Presidium, and then, at the end of February, by the Council of Ministers and later the Sejm. The creation of a Council for Basic Research has also been considered.

At the meeting of the Educational Secretariat of PAN, also mentioned were the financial difficulties of the PAN establishments and their staffs. The cost of educational research have increased to a larger degree than has been anticipated. Many branches lack the necessary money for carrying out their administrative functions. In the next two months, the administrators of the PAN offices will have to find a solution in this regard. Otherwise, it will be necessary to curtail research and reduce the staff. Prof Maczmarek said that the Academy authorities do not have any surplus funds left. They have no reserves with which to save their institutions. A scrupulous analysis of the situation at all the branches is essential, especially at those centers which, in the framework of their cooperation benefitting outside sources, could provide the possibility of assistance from industry.

Appointment of Scientific Secretaries

Warsaw TRYBUNA LUDU in Polish 1 Jan 84 p 2

[Article by PAP]

[Text] The president of the Council of Ministers, on the motion of the education secretary of the Polish Academy of Science nominated divisional and deputy secretaries for the PAN educational secretary.

Named to the post of deputy education secretaries were corresponding members of PAN: Prof Dr Henryk Cholaj and Prof Dr Saturnia Zawadzki.

Named to the positions of divisional secretaries:

--Division I--Social Studies, regular member of PAN, Prof Dr Witold Hensel

--Division II--Biological Studies, regular PAN member, Prof Dr Adam Urbanek

--Division III--Mathematical Studies, corresponding member of PAN, Prof Dr Wojciech Zielenkiewicz.

--Division IV--Technological Studies, corresponding member of PAN, Prof Dr Bogdan Ciszewski.

--Division V--Agricultural and Forestry Studies, regular member of PAN, Prof Dr Antoni Rutkowski.

--Division VI--Medical Studies, corresponding member of PAN, Prof Dr Miroslaw Mossakowski.

--Division VII--Geology and Mining Studies, corresponding member of PAN, Prof Dr Roman Ney.

In the name of the president of the Council of Ministers, General of the Army Wojciech Jaruzelski, the acts of appointment to these positions were presented by the executive of the Office of the Council of Ministers, Lt Gen Dr Michal Janiszewski, in the presence of the deputy director of the Department of Science and Educationa of the PZPR Central Committee, Dr Alfred Stroka, and of the educationa secretary and regular member of PAN, Prof Dr Zdzislaw Kaczmarek.

New Regular, Corresponding Members

Warsaw TRYBUNA LUDU in Polish 9 Nov 83 p 2

[Article by PAP]

[Text] The National Council approved the elections conducted on May 27, 1983, in which from among the corresponding members of PAN, 25 have been selected into the regular membership and 32 new corresponding members to PAN have been elected.

Elected into regular membership:

--Division I--Social Studies: Marek Fritzhand, director, Institute on Ethics, UW [Warsaw University]; Antonina Kloskowska, director, Institute of Cultural Sociology, UW; Wincent Okon, director, Didactic Department at UW's School of Pedagogy.

--Division II--Biological Studies: Wlodzimierz Ostrowski, director Medical Biochemistry Institute, AM [Medical Academy] in Krakow; Przemyslaw Szafranski, director Albumen Biosynthesis Institute, Department of Biochemistry and Biophysics at PAN; Adam Urbanek, secretary, Division II, Biological Studies, PAN, and Professor at the Paleobiological Institute, PAN.

--Division III--Mathematics, Physics and Chemistry Sciences: Wieslaw Czyz, director, Institute of Theoretical Physics, Nuclear Physics Institute, Krakow; Jerzy Haber, director Catalysis and Physico-Chemistry of Surfaces Department, PAN; Jerzy Janik, director Office for Structural Research, Nuclear Physics Institute, Krakow; Jerzy Los, director Department of Mathematical Adaptions for the Economy, Institute of Basic Information Science, PAN; Czeslaw Olech, director Mathematics Institute, PAN.

--Division IV--Technical Sciences: Zbigniew Brzoska, director Department of Material and Structure Stress Testing, Institute of Aeronautical Applied Mechanics, Warsaw Polytechnic; Roman Ciesielski, director Mechanics of Building Institute, Krakow Polytechnic; Witold Rosinski, consultant, Electronic Materials Technology Institute, Warsaw; Antoni Sawczak, professor, Constructional Theory Department, Institute for Basic Technical Problems, PAN, Warsaw; Jerzy Seidler, Director, Corporate Nautical Systems, Institute of Basic Informative Sciences, PAN, Gdansk.

--Division V--Agricultural and Forestry Sciences: Eugenjusz Comanski, retired professor from the Institute of Physiology and Animal Feeding, PAN; Wieslaw Grochowski, retired professor from the Institute of Forestry Research, Warsaw; Antoni Rutkowski, director Oil Seed Conversion Technology Department SGGW-AR [Main School of Farming] in Warsaw.

--Division VI--Medical Sciences: Kazimierz Dux, director, Tumor Biology Department, Institute of Oncology, Warsaw; Jan Nielubowicz, rector, AM, Warsaw, and Director, Surgery Clinic, Institute of Hematology, Warsaw.

--Division VII--Geology and Mining Studies: Alfred Jahn, director Geographic Institute, University of Wroclaw; Jerzy Kostrowicki, director, Geographic and Outer Space Management Institute, PAN, Warsaw; Ludger Szklarski, retired professor from AGH, in Krakow.

Corresponding Members

--Division I--Social Studies: Juljusz Bardach, Professor, Director, Department of Polish History and Jurisprudence, UW; Karol Dejna, professor, managing director, Institute of Polish Philosophy, UL [University of Lodz]; Konrad Jazdzewski, retired professor from UL; Mieczyslaw Krapiec, Professor, KUL [Catholic University of Lublin]; Tadeusz Lewicki, retired professor from UL, and Director, Committee on Oriental Studies, PAN; Marian Plezia, Professor Director, Medieval Latin Dictionary Workshop IFIS, PAN; Janusz Reykowski, Professor, Director, Psychology Department, PAN; Marian Szyrocki, Professor Director, German Philology Institute University of Wroclaw; Janusz Tazbir, Professor, Assistant Director, Institute, PAN; Jerzy Wroblewski, Professor, rector, UL and Director National Law and Theory Department, UL.

--Division II--Biological Studies: Tadeuxz Bielicki, assistant Professor, Director, Anthropology Department PAN; Kazimierz Browicz, managing Director for educational matters, and Director, Department of Systematics and Geography, Institute of Dendrology, PAN; Wladyslaw Grodzinski, Assistant Professor, Institute of Environmental Biology, UJ, and Director, Department of Water Biology, PAN; Wincenty Kilarski, Professor, Director, Scanning Microscopy Workshop, Department of Biology and Geology, UJ.

--Division III--Mathematical, Physics and Chemistry Studies: Henryk Iwaniec, Assistant Professor, Mathematics Institute, PAN; Stanislaw Kielich, Professor, Director, Non-Linear Optics Department, Physics Institute, UAM [Adam Mickiewicz University]; Andrzej Lasota, Professor, Director, Department of Biomathematics, Mathematics Institute, Slask University; Kasper Zalewski, Professor, Director, Department of High Energy, Institute of Nuclear Physics, Krakow.

--Division IV--Technical Studies: Andrzej Burghardt, Professor, Director, Department of Chemical Engineering and Apparatus Construction, PAN; Witold Ceckiewicz, Professor, Director, Institute for Urban and Outer Space Planning Krakow Politechnic Institute; Stanislaw Kocanda, Professor, Director, Machinery Construction Basics, WAT [Military Technical Academy]; Roman Pampuch, Professor, managing Director, Institute of Material Engineering AGH [Academy of Mining and Metallurgy], Krakow; Zdzislaw Pawlak, Professor, Director, Mathematical Informational Basics Department, Institute for Informational Principles, PAN; Piotr Wilde, Professor, Director, Institute of Water Development, PAN.

--Division V--Agriculture and Forestry Studies: Ryszard Babicki, Professor, Director, Wood Technology Institute, Poznan; Eugenjusz Biernacki, Professor, Director, Natural Forestry Basics and Forest Management Institute SGGW-AR; Tadeuxz Garbulski, Professor, Director, Institute of Physiology Studies, AR, Wroclaw; Zdzislaw Grochowski, Professor, Director, Department of General Agricultural Economy, Institute of Agricultural Economy and Food Management, Warsaw; Franciszek Wilczak, Professor, Director, Department of Animal Feeding and Fodder Management, SGGW-AR; Stanislaw Zagaja, Professor, managing director, Fruit Growing and Floricultural Educational Institutions, Skierniewice.

--Division VI--Medical Studies: Jerzy Gieldanowski, Professor, Director, Department of Research Therapy, Institute of Experimental Immunology and Therapy, PAN; Franciszek Kokot, Professor, Director Nephrologic Clinic, and rector, Slask Medical Academy, Jerzy Koscielak, Professor, Director, Biochemistry Department Institute of Hematology, Warsaw; Andrzej Trzebski, Professor, Director, Department of Physiology Studies and Vice-rector,AM, Warsaw.

--Division VII--Geology and Mining Studies: Krzysztof Birkenmajer, Professor, Geological Institute, PAN; Boleslaw Malisz, Professor Emeritus, Institue of Geography and Outer Space Management, PAN; Michal Odlanicki-Poczobutt, Professor Emeritus, AG-H [Academy of Mining and Metallurgy] Krakow; Leszek Starkel, Professor, Institute of Geography and Outer Space Management, PAN.

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ROLE, TASKS OF SCIENCE ACADEMY IN SCIENCE SYSTEM DESCRIBED

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[Report by Learned Secretary of the Polish Academy of Science [PAN], Regular Member of the PAN, Professor Dr. Z. Kaczmarek, read at the 57th General Session of the PAN on Jan 27, 1983 in Warsaw: "The Role and Tasks of the Polish Academy of Sciences in the System of Polish Science"]

[Text] Poland is still in a state of deep political and economic crisis, whose sources, cause and consequences are subjects of discussion and grounds for conflict in various social groups. This applies also to the scientific community. Reflecting over the future is certainly an important factor in developing the public consciousness, especially if it protects against recurrence of errors. I believe, however, that for the vital interests of a nation that has experienced a decline of the standard of living and aspirations the deepest in postwar Europe, the crucial issue is to find effective and realistic paths leading out of the crisis. Serving this cause is the obligation of science towards the state and the society. Society's obligation towards its own future is creating for science conditions allowing it to accomplish its tasks.

A year ago, I published in TRYBUNA LUDU an article dealing with the position and tasks of science in the current period.* Although some time has passed since then, the basic propositions of that article remain operative, and I will refer to them. I pointed out at that time that frustrations among the scientific community, the distrust in which the public holds us and partly damaged administrative systems have combined to create a configuration that did not bode well for science, although surmounting prejudices was the task of the time. The political leadership of the nation has addressed this issue many times. This imposes on all parties concerned the obligation to seek a platform for constructive action. National reconciliation in Poland should find support in scientific principles of economic organization and public life that would be free of arbitrariness and voluntarism.

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*TRYBUNA LUDU 1982 No 12.

Our duty is to create the principles of rational thinking and find solutions that would promote:

--raising the efficacy of economic mechanisms of methods of government, administration and social management;

--rebuilding the social attitudes, especially increasing the influence and responsibilities of the younger generation of Polish people for their country's destiny; and

--adapting the economic structure and technological capabilities to the raw material and personnel and labor potential of the nation, taking into account the development trends in the world markets.

Among the trends of particular economic significance, one should mention the exploration and processing of energy resources, reduction of materials-intensiveness of products, development of the electronics industry, work in biotechnology, progress in health protection, methodology and many others. The issue of basic research holds a special place.

Solution of these problems is crucial for the future of Poland, for the fate of our nation. Currently, the gross national product per Polish citizen is not more than one-fourth of the value in highly developed European nations. There are drastic disproportions between aspirations of the Polish people and the capacity for meeting them as afforded by the actual situation of the country. Only an extreme and wisely governed effort of the society can change this situation over the coming 10 to 20 years. I am convinced that much depends on the attitude of the intelligentsia, especially the scientific community. This cause is damaged by attempts currently made by opposition circles to shift the center of gravity of the political conflicts into the professional circles. Given individual instances of misunderstanding, mutual accusations and hostility among a part of our community and some representatives of the government are disconcerting. I believe they stem from mutual failure to understand the motivations and intentions, and unjustified primacy of political emotions over the need to cooperate in order to attain common goals. Internal quarrels among scientists about problems of a secondary importance largely motivated by narrow interests rather than concern for the future of Polish science as a whole are also futile.

The basic document defining the political positions in regard to the assignments and situation of science is the resolution of the Ninth Congress of the PZPR. This is a remarkable document which deserves a close look. Among other things, it contains the following statements:

--the development and application of research is one of the basic factors for pulling the nation out of the socioeconomic crisis;

--science will be as far as possible shielded from the effects of current difficulties;

--the function of science as rendering a service to society calls for a harmonious coordination between the theoretic-cognitive and pragmatic functions;

--reducing outlays to basic research would jeopardize the long-term interests of society;

--defining a long-term program of the development of science and technology is indispensable;

--a condition for allowing science to fulfill its tasks is freedom to have and express different scientific opinions and evaluations;

--it is necessary to arrange for effective cooperation with science abroad, especially in socialist countries; and

--the system of management of science and education should guarantee the priority of general public interest, ensuring a democratic organization of the participant institutions and precise definition of responsibility for the decisions made.

The Ninth Congress emphasized that "the party will take care of the situation of the Polish Academy of Science, which is an association of prominent scientists from higher school and research institutions, and has at its disposal its own base of research facilities. The Congress has addressed the PAN with an appeal to work in cooperation with the higher schools as an initiator-organizer and supporter of basic research and serve as a scientific counsel to government and society."

I have quoted this excerpt from the resolutions of the Ninth Congress not only because they are binding for me and other party members in this meeting, but primarily because they contain postulates that are valid and important for science, although implementing them sometimes involves conflicts. It is not surprising that the position of the Congress met resistance from a part of the scientific community sharing oppositionist views, as was expressed especially in public statements in the second half of 1981. The antisocialist opposition attacked the party and government regardless of their positions and activities in the area of science policy. What is surprising is the slighting and sometimes undermining of these decisions of the Ninth Congress by certain representatives of various levels of the government, voicing their opinions as to the status, role and prospects of Polish science.

After working for over 35 years in institutions belonging to various so-called levels of science, I am far from idealizing the current situation in this sphere. Our community is extremely varied, both in terms of competence levels and as regards degree of participation in present and future Polish problems. These differences concern equally higher schools and research institutes, including those within the framework of the Academy. Rational actions called for by this situation should support the creative

and valuable aspects of Polish science, and, on the other hand, limit by administrative efforts the possibilities for work by weak, ineffective units that carry no promise of creative activity.

This is the position adopted by the Presidium and Learned Secretariat of the Academy, and it serves as a guideline in our attitude toward our own institutions. I cannot, however, agree with the overall criticism that extends to the entire scientific community and its individual levels--regardless as to when and by whom such opinions are offered. Those making such generalized statements either are ignorant of the issues being discussed or are guided by narrow political or social expediency.

The public climate is a major factor in the operation of science, because creative communities more than anybody else are sensitive to the response and evaluation by their environment. This is, however, not the main cause for raising the issue of making objective judgments concerning scientific activity. Science is financed by public funds, especially the government budget. This is so in Poland and apparently in all modern nations, whether the scientific community likes this state of affairs or not. It is impossible, therefore, to create the necessary material conditions for research without attaining a certain level of public acceptance and support by government. Is there a conflict between the free scientific creativity and the governmental and industrial sponsors of research? Yes, conflicts can arise in this situation, and the good judgment of authorities as well as the scientific community is essential for proper resolution of the arising tensions in a way that would benefit the overriding interests of the nation.

I want to raise a question as to what place is occupied by Polish science in this first year of the crisis which torments our nation. I will formulate the answer in several theses, which, of course, are not free of subjective evaluations and feelings.

First, I believe that regardless of political disputes which divide our community as well, research institutes and higher schools have succeeded --within the limited material capacity--to implement in this period their research program. Many projects have been completed in this time, and the results were transferred into the economy or promulgated in publications. Most scientists are willing to participate in research and consultation activities to help overcome socioeconomic difficulties.

Second, at least 80 percent of research projects currently under way in Poland make part of the state research program encompassing national, nodal, interministerial and ministerial issues. The participation of the scientific community in formulating these problems has been and remains significant, but they have been analyzed, evaluated and approved as priorities during the course of official government discussions at the level of ministerial leadership. If today we hear criticism concerning the choice of projects to be performed, this is primarily evidence of weak government science policy and the agencies that are

leading in this area, including the Polish Academy of Science. It seems that the proper choice of subjects for applied and basic research is the most difficult, still unresolved component of science policy.

Third, I believe that the manpower potential of Polish science is strong and, as regards the highest qualified groups--professors, associate professors and holders of doctoral degrees--it has not been reduced by the crisis. In this category, the number of employees at higher schools and research institutes has increased from 33,600 in 1978 to around 39,000 in 1982. Contrary to the common view in the recent past, I believe that employment of unqualified individuals for independent positions in science occurred in few instances, while the average level of our research personnel is high. Lately, disconcerting phenomena have come to light, however:

--in 1978-82, the total employment in "science and technological development" sector declined by 20 percent (some 30,000 employees), which means a deterioration of the ratio of highly qualified to assistant personnel;

--the failure to resolve the wage problem at research institutions and the decline of real wages in them, which is much deeper than the average for the nation, has produced a drastic growth of social tension in this community; and

--the worsening material supply situation for research laboratories reduces the efficacy of research personnel. These issues call for a profound analysis and thorough resolution.

The fourth thesis concerns the research financing in Poland. Nominal outlays on research and development between 1979 and 1982 rose from 37.1 billion zlotys to around 64.0 billion zlotys. In the meantime, however, the material and labor costs of this work have also grown substantially, meaning that, if reduced to 1978 prices, the real spending over the past five years dropped by some 25 percent. This is understandable, because Poland's gross national product has declined by approximately the same amount, and we could hardly expect science to be immune to the consequences of the deep economic crisis. In the past few years, we at the Academy have focused attention on financial management of research facilities. The discussions have been useful and are by no means completed. I believe, however, that concentrating attention on methods of using research funds, we have thought insufficiently about the sources and potential sources of these funds. This, however, is becoming a key problem. For 1984, the central government agencies have the following appropriations for research and development:

--an allocation of 28.0 billion zlotys in the national budget; and

--an allocation of some 20.0 billion zlotys in the form of the Central Fund for Technical-Economic Progress, created from obligatory contributions by industrial enterprises, remitted to the account of the Ministry of Science, Higher Education and Technology.

A similar amount of 20.0 billion zlotys remains at the disposal of the enterprises.

Under the new legislation regulating the principles of economic reform, the situation has changed basically starting from 1984, when the CFPTE will be abolished and the contributions of industrial enterprises in their entirety will remain as discretionary funds administered by the enterprise directors and workers' self-government. In practice, that means a 42 percent reduction of government funds for technical and scientific research that until now has been used to finance the national, nodal, interministerial and ministerial projects and the research work conducted by higher schools and research institutes. I think that this is incorrect and is at variance with the practices of other nations. This is equivalent to excessive restraint of government sponsorship in the sphere of science and technology, and transfer of the center of gravity to contractual relationships between research institutes and organizations in the industry. Will this have an influence on the financing of basic research? I believe this influence will become quite apparent soon, first of all, in an increased pressure by research units within the ministerial framework for budgetary funds.

I dwelt for a longer time on the economic aspects of science, because in the coming years they will become crucial in deciding on the areas of research, especially, basic studies and the level of wages and investment. The situation is compounded by inflationary dangers. The continuing inflation causes further decline of real value of funds allocated to research and development.

Financing science is an important element of science and technology policy in Poland (but not the only one) which requires new ideas and must be shaped in a more efficient way than what we have had until now. The organizational changes in the governmental system of management of the scientific and technological sphere currently being prepared are expected to serve this purpose. In developing the concepts expressed in the memorandum submitted by the PAN leadership to Chairman of the Council of Ministers concerning the guidance to science and technology in Poland, I will offer some of my personal thoughts on the most urgent assignments of government science policy and the functions of the agencies administering it.

First of all, I believe that science policy and technological policy are different although closely linked elements of the system which serves to:

--support scientific creativity as the basic factor in national cultural progress;

--initiate and organize research that would provide the groundwork for technological progress and improved economic management at present and in the future; and

--create conditions and mechanisms for utilizing the domestic and foreign scientific and technical accomplishments to benefit society's life and industrial processes.

The government's policy in relation to this area should be coherent while leaving wide freedom for particular solutions. Its success is largely predicated on the capacity for efficient liaison between the government agencies and scientific community, with its self-government structures.

Along these lines, the leadership of the Academy has advocated the creation of a coordination mechanism for the entire science and technology at the level of the Council of Ministers, the creation of a competent and properly authorized government agency for applied research and technological progress and for committing to the PAN, in cooperation with higher schools, the responsibility for basic research.

This system should be organized in the shortest possible time, because it will have to resolve urgent problems that have not been dealt with thus far. These include, among other things:

--the need for developing in 1983 a new system for selection, planning, financing and controlling central research projects that would replace after 1985 the existing system of classification of national, nodal and interministerial problems, while retaining the positive experiences in forms of this coordination of research;

--the definition of the proper proportions between the government and extragovernmental funds allocated to research and development and the share of allocations to basic research;

--analysis of the regulations governing the principles of economic reform from the viewpoint of incentives to innovation;

--a linkage between the decisions in research and development and the directions of investment policy;

--personnel policies, especially in ministerial research institutes, and proper development and implementation of adequate remuneration principles; and

--coherence of government, science and technological policies in the environment of growing self-government structures.

This list is incomplete, but it stresses the importance of questions that have to be resolved. One is doubtless--the socialist state and its organs are and will be responsible for science policy and modernization in the economy. Therefore, they must have effective tools for implementing this policy.

I have the privilege to report to the General Session that the work on this new organizational system of the leading organs of the government science policy is in an advanced stage. The positions prepared for final decision, and mainly coordinated, concur with the stance of leadership of the Academy. They concern the following:

--the proposal for creation of a main organ of government administration that will be responsible for policies in the area of applied research and technological progress in the economy and will have the means, implementation systems and appropriate coordination authority; it is proposed that this organ will bear the nature of a collegial body with members of the panel including, among others, the Planning Commission of the Council of Ministers, the Polish Academy of Science, the Ministry of Science and Higher Education and other concerned organizations; and

--the proposals to create a Council or Committee of the Council of Ministers for science, education and technological progress on a par with other government committees already operating that would be authorized to take or prepare basic government decisions on matters concerning this sphere.

Proposals being prepared also postulate coordination of government policy in basic research, although they do not specify the individual organizational solutions. The current series of meetings of the General Session, the discussions and issues will certainly have influence on the future decisions in this area.

Against this background, we should discuss the place and role of the Policy Academy of Science, its duties and our organizational problems. Over more than three decades of its existence, the Academy has been shaped as:

--self-governing and (let us say this frankly) elitist association of scientists;

--a representative body for the community of higher schools and research institutions whose representatives are members of academy committees and commissions;

--a government center of basic research; and

--one of the organs of government science policy.

During the past three years, all these functions of our institution have been subjected to critical analysis. Representatives of the political opposition saw in our Academy, depending on their temperament, now a dinosaur from the Stalinist epoch, now at best a tool of policy beholden to government. We also were told that the committees do not represent anybody, even though the scientific committees in some fields numbered virtually all active scientists in a given field among their membership.

One publication reproached the General Session of gerontocratic proclivities, which, incidentally, is a reflection of a broader phenomenon of discontent among the younger generation of scientific workers with the activity of their superiors, who, naturally, must be of an older age--professors and associate professors. Higher schools fear that the Academy will dominate their research activities. And from government circles we often hear the reproach that the PAN pays little attention to governmental and societal needs. These are just a few of the manifestations of conflicts and misunderstandings. Many of these simply reflect the tensions among group interests, and surmounting them calls above all for a calm and reasoned approach. There are, however, in the Academy certain issues that call for profound analysis and for drawing conclusions from criticism.

The research potential of the Academy is not large, especially if compared with academies of science of other socialist nations. The institutes and independent enterprises of the PAN employ 6.4 percent of the total scientific manpower of the nation, including 8.6 percent of professors and associate professors. If we count exclusively the institutions outside of the higher educational sphere, the manpower potential of the PAN's research units will be 20.0 percent of research workers and 31.2 percent of professors and associate professors working in the sphere of science and technology. The cost of research conducted at Academy institutes amounted to one-seventh of the total outlays on research (without development) in the nation. It should be stressed that the PAN benefited almost exclusively from government allocations for research; the national budget for 1983 assigned to the Academy 21.8 percent of budget allocations for research, and this share has been systematically growing over the past three years.

The PAN institutes and most scientific committees are mainly concerned with basic research. There is no need for defining their scope here for this audience. One may, however, expect questions, especially from our government sponsors, as to whether basic research is a purely intellectual pastime or serves definite public needs. My answer to this question is unambiguous: in modern science, most basic research leads indirectly to short-term and long-term utilitarian objectives:

--preparing the process of education of highly skilled personnel;

--exploring the social and natural phenomena and processes for their subsequent mastering; and

--creating new research methods.

The development of basic research also helps build up a nation's prestige in the modern world of acute political and economic competition. National interests, and nost just the interests of the scientific community, require maintaining scientific research in Poland at a high level despite the crisis and maybe even because of it. A failure to understand this is evidence of ignorance.

The Ninth Congress of the PZPR called upon the Polish Academy of Science to organize and support basic research in a collaboration with higher schools. The leadership of the Academy has repeatedly expressed its willingness to undertake this obligation. Steering basic research involves selection by the scientific community of the principal lines of study, coordination of these trends with the needs of the nation and appropriate distribution of financial means. The particular subjects of basic research, however, do not lend themselves to rigorous planning. Transferring into this sphere the experiences and methods of organization of applied research would be an error, complicating the research process by excessive bureaucratic controls.

The structure of scientific sections and committees of the PAN creates optimal conditions for objective and realistic setting of priorities in basic research. In particular, the personnel structure of scientific committees, which approximately corresponds to the research potential of individual spheres of Polish science, seems to serve best the solutions unaffected by influences of local interests of individual groups in the scientific community.

The leadership of the Academy has proposed to the Chairman of the Council of Ministers to create a Council of Basic Research, which, under the guidance of the President of the PAN, would bring together the representatives of the Ministry of Science, Higher Education and Technology, the Learned Secretariat of the PAN, representatives of other concerned ministries and members of the scientific community. The functions of that council would include:

--coordinating the policies in the sphere of basic research;

--selection of priority trends of research and supervision of their implementation; and

--recommendations concerning the distribution of financial allocations contributed by the government to the priority trends of research.

The Council of Basic Research should be appointed by the Chairman of the Council of Ministers and operate under the aegis of the Polish Academy of Science.

In this framework, I will make several remarks concerning the functions and organization of the Polish Academy of Science and some related legal aspects. I have always advocated a tripartite formula for the Academy: representation of the scientific community, a government (state) center of basic research and one of the organs of the national science policy. Implementing these three functions may result in conflicts which have to be resolved.

Various proposals have been offered by different parties. Some suggest, for instance, separating the Academy, conceived as an association of

scientists, and a representative body of the scientific community, from its subordinate research institutions. Others question the legal competence of the PAN in guiding and coordinating basic research. There have also been some utopian proposals suggesting that the tripartite formula of the Academy should be maintained, while at the same time it should be made autonomous and independent of the state, specially government administration.

At the end of March of 1982, I submitted to the Chairman of the Council of Ministers a draft statute of the Polish Academy of Science in fulfillment of an obligation imposed on me by the government. I am fully responsible for the essence of this document, even though I have introduced into it some 30 amendments as a result of discussions held on March 27, 1983, by members of the Presidium of the PAN, which entered this document in its records. In preparing the draft statute, the results of a discussion conducted in 1981 by the Presidium of the Academy with the participation of the members of trade unions, were put to use. This concerns specifically the rights and obligations of the members of the Academy, its General Assembly, the Presidium and its sections, as well as the role and competence of individual scientific committees. In this area, the draft submitted to the government is identical to propositions approved in November 1981. The differences, however, appear in the proposed method of guidance of research facilities, in the definition of the position and functions of the learned secretary of the PAN and the supervision by the Council of Ministers of the research activities conducted by the Academy.

The draft statute of the PAN is currently being reviewed for interministerial coordination. Comments have been received from almost all ministries, and the Commission of Science of the Central Committee of the PZPR, the Legislative Council of the Office of Council of Ministers have expressed their opinions. The document has also been discussed by the Professional Party Organization of the PAN, the Committee of Public and Scientific Initiatives operating at the Academy. The opinions received thus far are extremely diverse. The differences concern particularly the following issues:

--the place and functions of the research facilities of the PAN; there are proposals (for instance, by the Legislative Council of the Office of the Council of Ministers) that these aspects should be deleted from the statutes of the Academy and that the legal regulation of the PAN research institutes should be done by a statute of scientific institutes that would encompass the entire scientific sphere; there are also suggestions that research institutes should be excluded from the organizational structure of the Academy;

--coordinative authority of the Academy in the area of basic research; the solutions that we have proposed are, in particular, questioned by the Ministry of Science, Higher Education and Technology;

--the obligations of the Academy towards the government and the society in the area of scientific research and counseling; and

--self-government authorities of the institutes in relation to the functions of the General Assembly, Presidium and sections of the PAN; the place and authority of the party organizations in the system of management of the Academy.

I believe that the solutions contained in the draft statute of the PAN constitute a sensible compromise between various tendencies, a trade-off between the interests of the general public and the position of the scientific community. While ensuring a proper place for the Academy's self-rule, the document contains provisions for the government influence on Academy's activities in the sphere of science policy. This, of course, does not mean that the specific statements of the document could not be amended.

At this point, it is hard to predict the future fate of the draft statute. I believe that before the final review by the Council of Ministers and before it is sent for approval to the Sejm, it should be once again submitted for discussion at a meeting of the Presidium of the Polish Academy of Science that should be open to all members of the PAN.

To conclude, I will quote from the resolution of the General Assembly approved in December 1980. At that time we wrote: "Our country is facing a deep crisis and also a unique opportunity for rebirth. Today we must all be active and believe in the future to be able to make use of this chance. Polish science, in keeping with its traditions, in each situation and always is serving the truth, the people and humanity, and should devote all its efforts to the cause of democratic renewal. The General Assembly of the Polish Academy of Science appeals to all Polish scientists to join ranks with the forces of progress, Polish working class and the entire nation and give all their knowledge to the cause of Poland and the socialism in Poland."

Let us try to fulfill this appeal in our day-to-day practice.

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